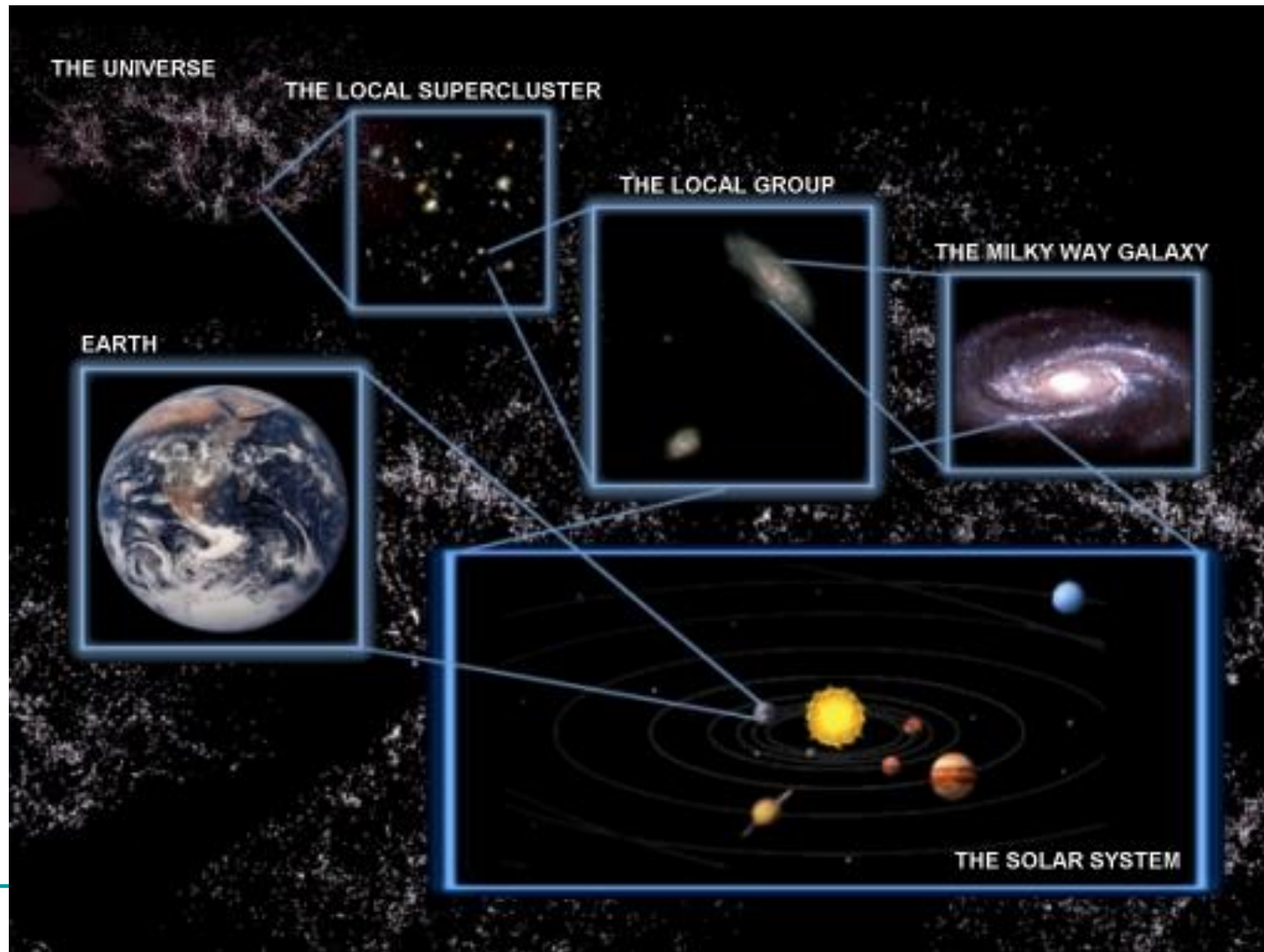


# The Study of the Universe



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# Some stars and planets in scale:

- A little perspective on how big we are in the universe:

<http://scaleofuniverse.com/>

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# Kepler telescope



© picture-alliance/dpa/ Nasa/Jpl-Caltech/T. Pyle

- \$600-million Kepler spacecraft has discovered more than 960 planets orbiting nearby stars.

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\$600-million Kepler spacecraft has discovered more than 960 planets orbiting nearby stars.

- Scientists have discovered three or four new Earth-like planets outside our solar system that exist within the very thin "Goldilocks" band between too hot and too cold that makes them habitable
  - two of the planets are the closest to our solar system of any detected before - at about 500 and 1,100 light years away
-

- 
- The two planets are likely to be rocky like Earth, not gas giants or ice worlds.
  - They are approximately the same size as Earth, and receive about the same amount of energy from their stars as we do from our sun.
  - However, considering their positions, if they have atmospheres similar to ours, one would have a temperature of around 140 degrees Celsius and the other at a chilly zero
-

- 1 light year equals 9,461,000,000,000 km.
- the circumference of the Earth when measured at the equator: 40,075 km.
- Kepler is too far away to study and even consider as a second home.
- We need technology to catch up.



# 7.1 Ancient Astronomy

Note: Astrology is a belief that the constellation in which you were born would determine your character and destiny.



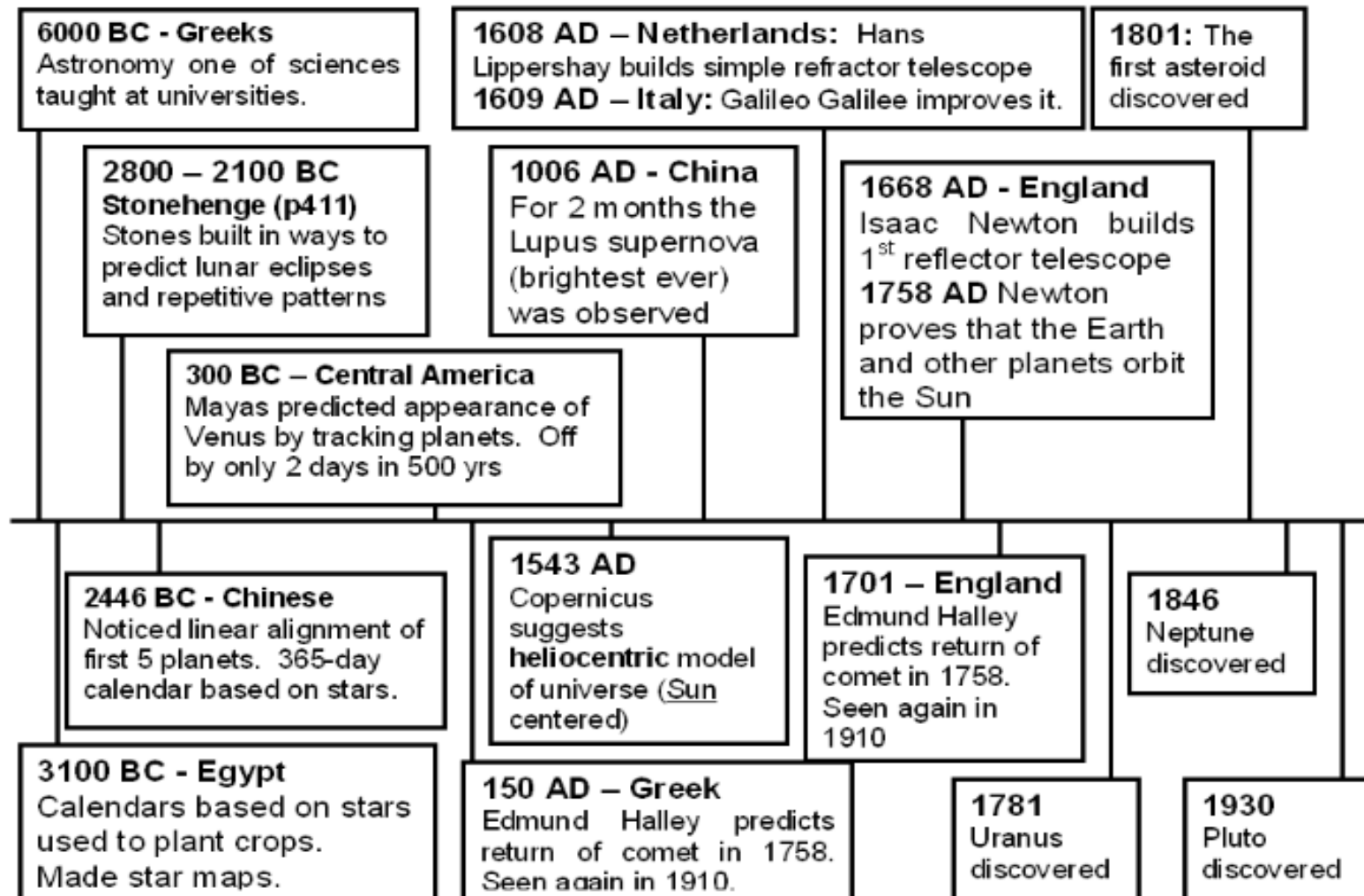
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# Astronomy

- Although astronomy and astrology were linked in ancient times, they are very different now.
  - **Astronomy** is the study of celestial bodies beyond Earth. It is based on evidence.
-





**Early Ideas About The Universe**

# Early Astronomers

- Very early on, sky watchers in the Middle East, Egypt, India, and China measured positions of **celestial objects** which are any objects that exist in space, such as a planet, a star or the Moon.
- Mesopotamians (living in what is now Iraq) were the first **astronomers** (scientists who study the night sky) and began keeping calendars 6000 years ago.







# Maya Civilization Pyramid

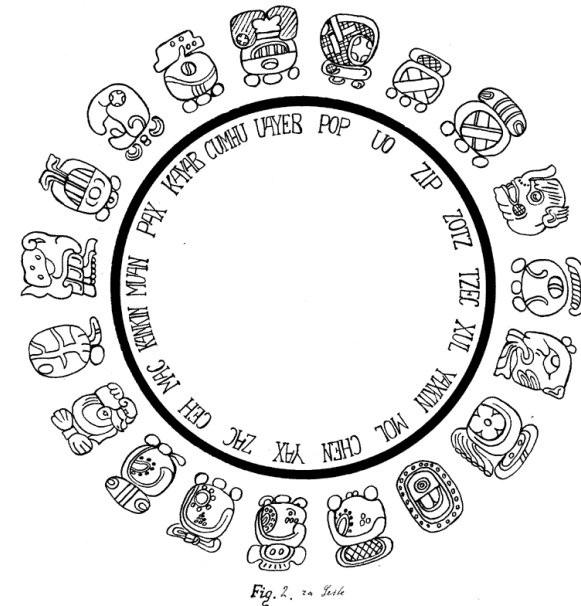
4 stairways x 91 stairs (steps), + top platform = 365



Represents the 365 days of the year

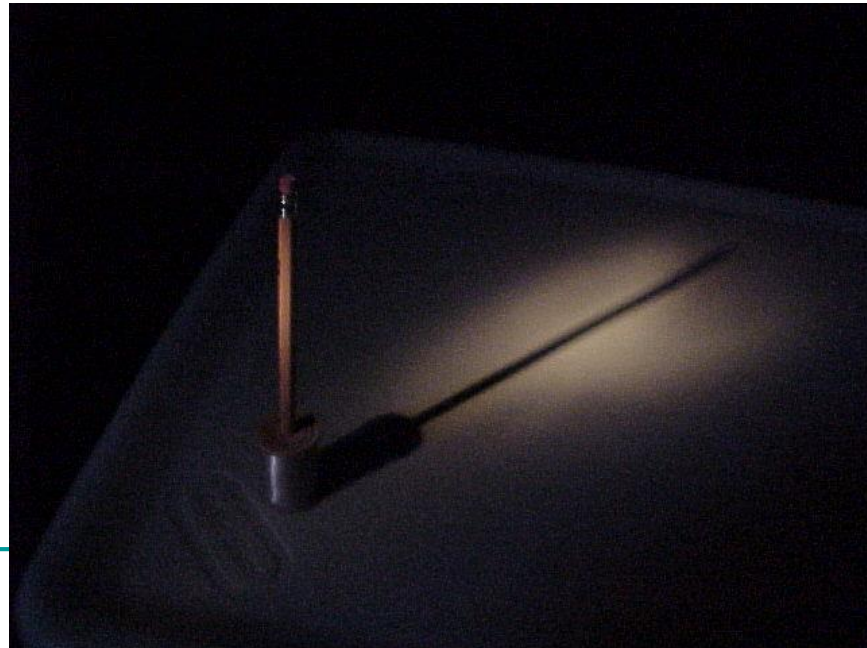
# Early Calendars and Sky Observations

- A **Calendar** = a way of showing days, organized into a schedule of larger units of time such as weeks, months, seasons, or years, usually a table or a chart.
- Calendars allowed people to predict:
  - Periods of rain → agriculture
  - Migration of animals → hunting
  - Periods of flooding → Egyptians and star « Sirius »





- The early **clocks** were developed by curiosity
- Based on observations of the movement of the sun across the sky as determined by the shadows cast by the sun (stick → shadow).



- 
- Today, a year is calculated by the time it takes the Earth to make one **revolution** around the Sun.

**Revolution** = the time it takes for an object to orbit another object; Earth's revolution around the Sun is 365.24 days (provides the planet with seasons)  
The extra quarter day adds up to one extra day **almost** every 4 years – a leap year!

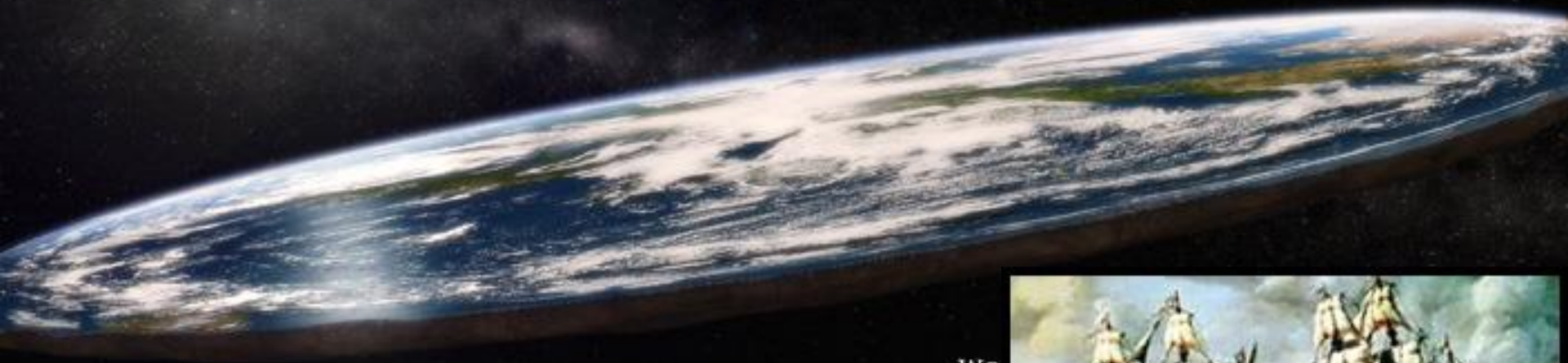
- A day is calculated by the amount of time it takes the Earth to complete a **rotation**.

**Rotation** = the turning of an object around an imaginary axis running through it. (provides the planet with day and night)

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What if  
**Earth**  
was flat?



Wo



# Earth's Spherical Shape

3 pieces of evidence, discovered by the Greeks, led to the belief that the Earth did in fact have a spherical shape (310-230 *B-C*)



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# Inferring Earth's Spherical Shape

## 1. Disappearing Ships

- As ships move away from an observer, they gradually disappear below the horizon.

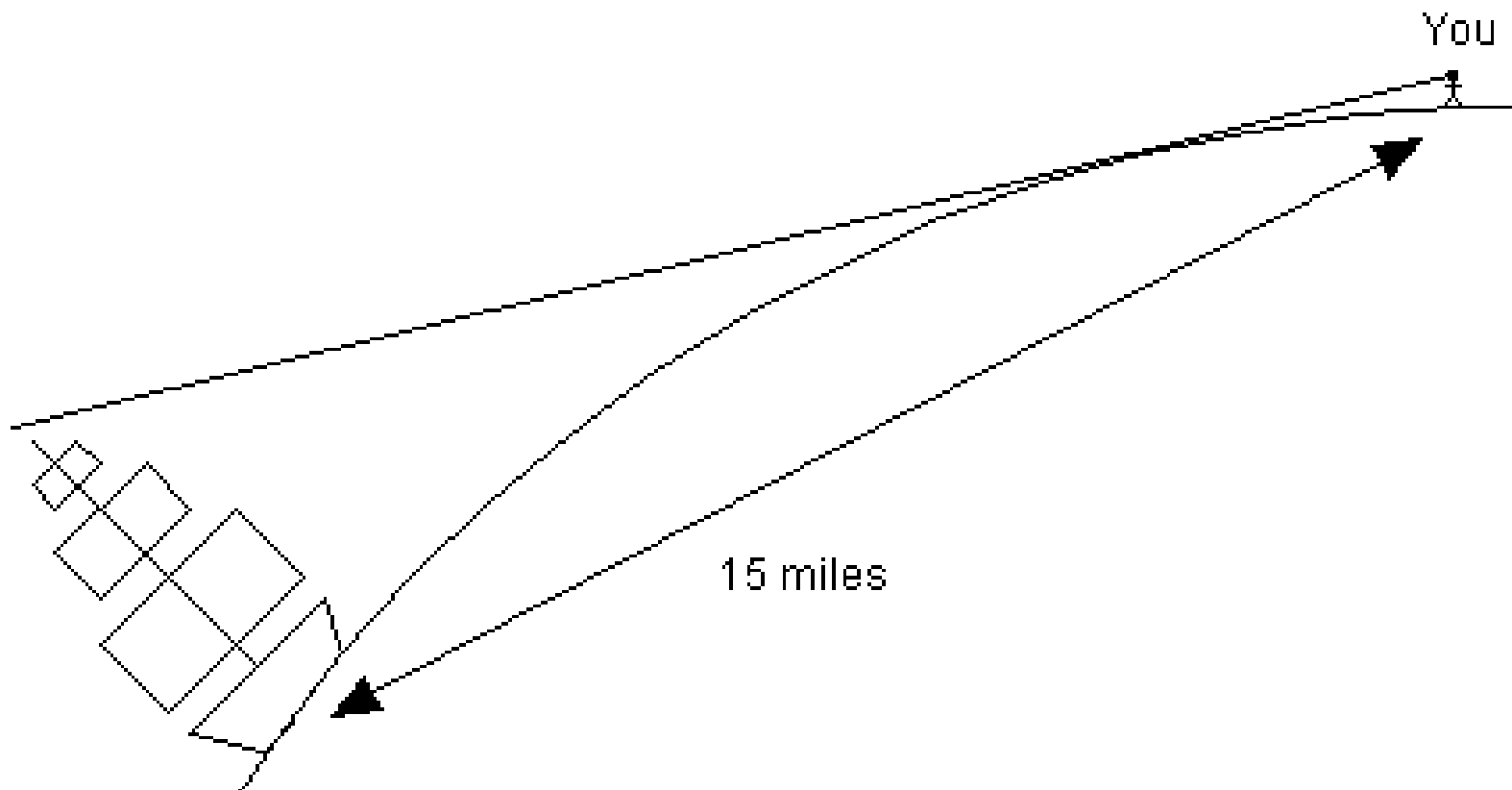
## 2. The Changing Sky

- People in the South see different stars than people in the North

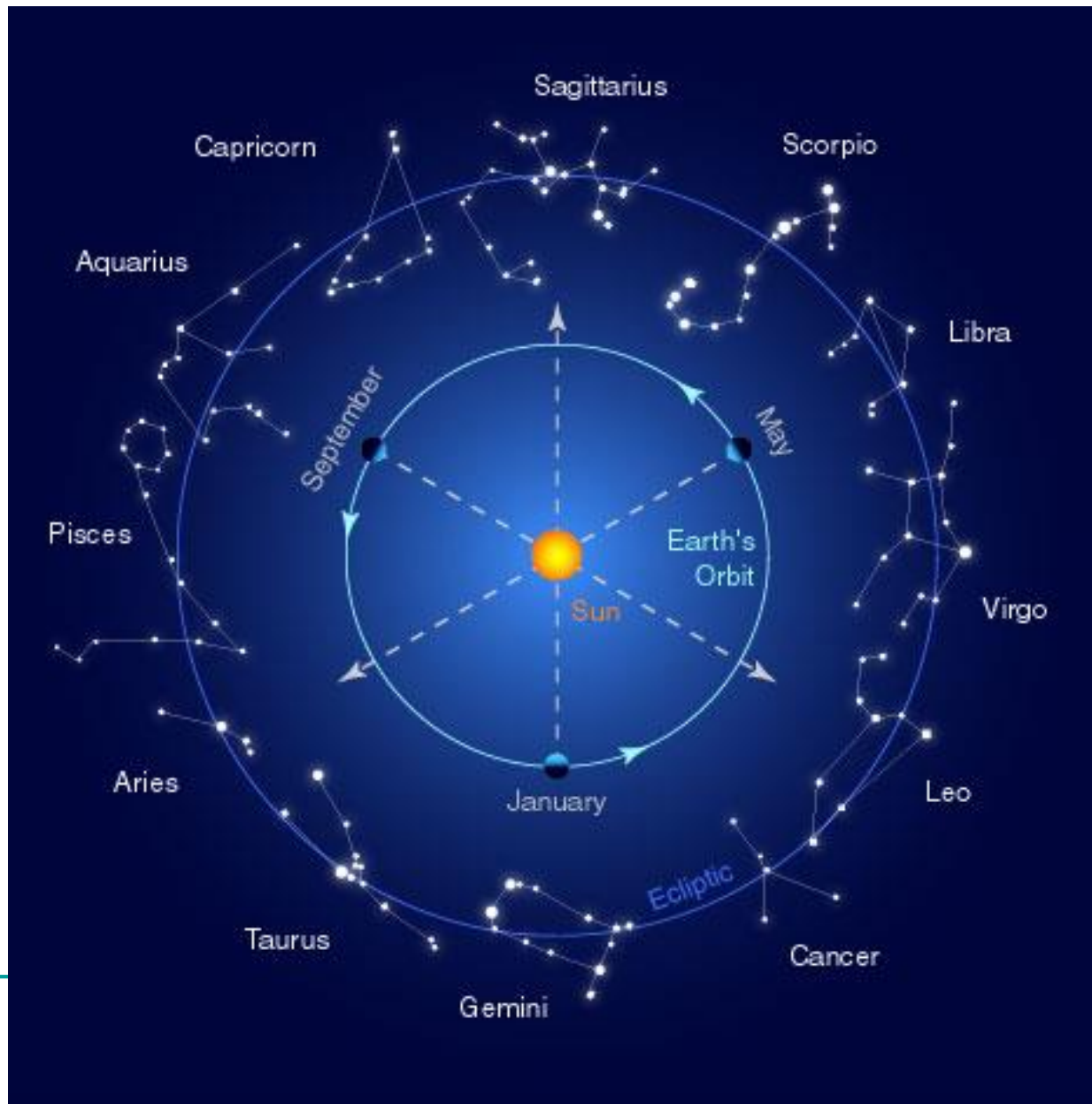
## 3. Earth's Curved Shadow

- The shadow of the Earth on the Moon during an eclipse is curved
  - 10 Reasons the Earth is round
-

# Disappearing ships (fig. 7-4)

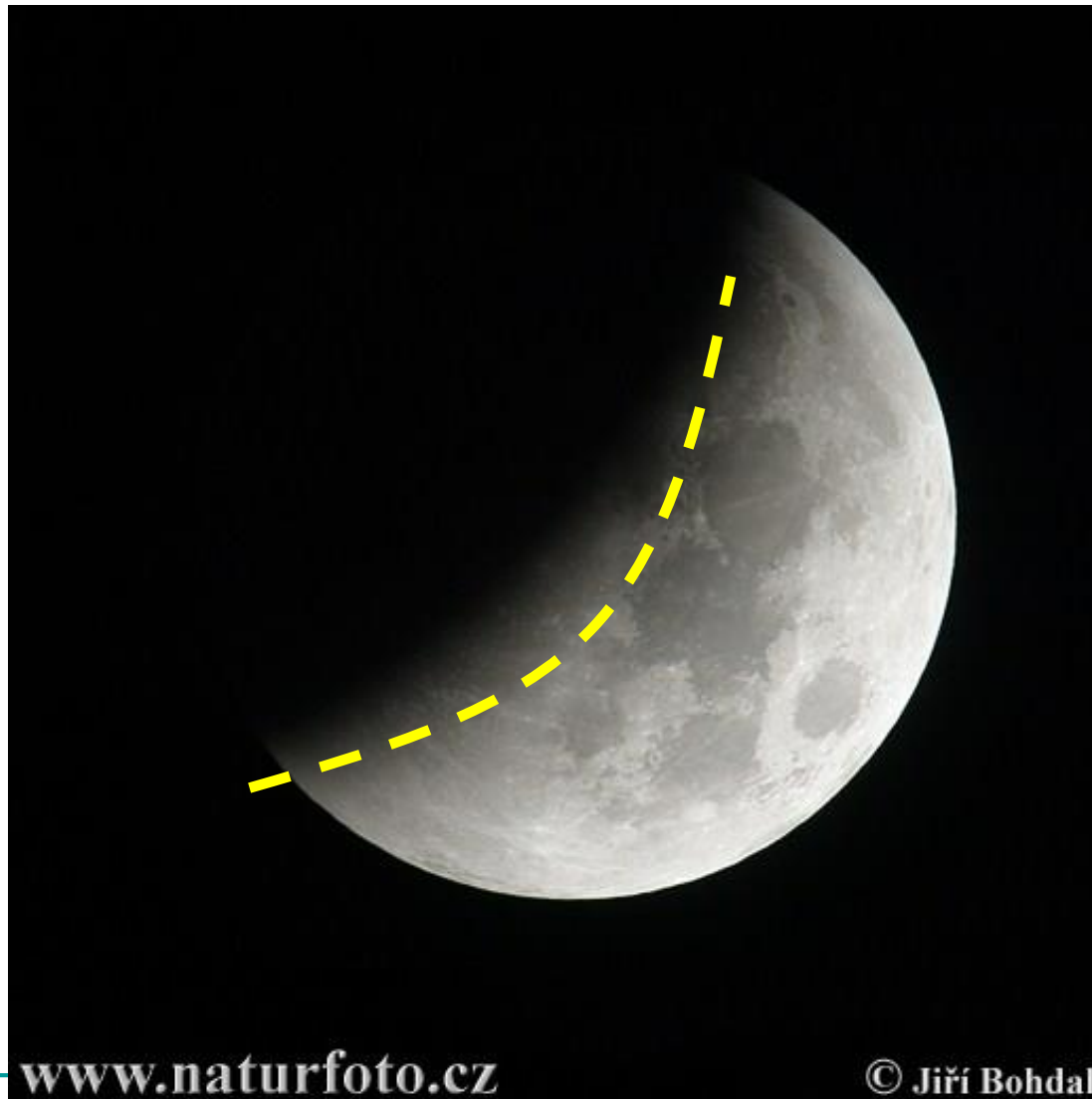


# The Changing Sky (fig. 7-5)





## Earth's Curved Shadow (fig. 7-6)



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# Homework

- Read p.254 to 259
  - Constellation Assignment, due at end of unit
  - Decide on a constellation for tomorrow.
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